

REMARKS

The applicant respectfully requests reconsideration in view of the amendment and the following remarks. The applicant has amended the title as suggested by the Examiner. Support for amended claim 2 can be found in the specification at page 23 and page 8 for the definition of Ar. Support for amended claim 12 can be found in the original claim 12. No new matter has been added.

Claims 1-3, 9, 10, 12, 14, 15, 24, and 25 are rejected under 35 U.S.C. 102(b) as being anticipated by Pineri (WO 2002/046278; equivalent US 2004/0058216). Claims 4, 5, 7, 17-19, 26, 29, 30, 34, 35, 39, 44, and 45 are rejected under 35 U.S.C. 103(a) as being unpatentable over Pineri as applied to claims 1 and 15 above and further in view of Cavalca et al (US 6,300,000). Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Pineri in view of Cavalca et al as applied to claim 5 above and further in view of D'Agostino et al (US 4,012,303). Claims 8, 11, and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Pineri as applied to claims 1 and 10 above and further in view of Savinell et al (US 5,525,436). Claims 16-18, 20, 21, and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Pineri as applied to claims 1 and 19 above and further in view of Bonk et al (US 6,399,234). Claim 22 is rejected under 35 U.S.C. 103(a) as being unpatentable over Pineri as applied to claim 1 above, and further in view of Bonk et al and Okamoto et al (JP 2001-196082). Claims 28, 31, and 33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Pineri and Cavalca et al as applied to claim 5 above, and further in view of Savinell et al. Claims 36-38, 40-41, and 43 are rejected under 35 U.S.C. 103(a) as being unpatentable over Pineri and Cavalca et al as applied to claim 35 above, and further in view of Bonk et al. Claim 42 is rejected under 35 U.S.C. 103(a) as being unpatentable over Pineri and Cavalca et al as applied to claim 5 above, and further in view of Bonk et al and Okamoto et al. Claims 46 and 47 are rejected under 35 U.S.C. 103(a) as being

unpatentable over Pineri and Cavalca et al as applied to claim 5 above, and further in view of Steck et al (US 5,464,700). The applicant respectfully traverses this rejection.

It is noted that at page 14 of the Office Action, the Examiner stated that the drawing constitutes new matter. The applicant respectfully disagrees because the drawing was never submitted as part of the application. It was only used as evidence.

Rejections under 35 U.S.C. 102(b)

Claims 1-3, 9, 10, 12, 14, 15, 24, and 25 are rejected under 35 U.S.C. 102(b) as being anticipated by Pineri.

The instant invention is directed to a membrane electrode assembly comprising two electrochemically active electrodes separated by a polymer electrolyte membrane, characterized in that there is a polyimide layer on each of the two surfaces of the polymer electrolyte membrane that are in contact with the electrodes (see claim 1).

In other words, the polyimide film is located between the membrane and the electrode acting (i) as a subgasket material and (ii) enhancing the mechanical properties of the membrane. The core of the instant invention is the applicant's polyazole/phosphoric acid electrolyte membrane (Celtec[®] L or Celtec[®] P) which is covered by the term "polymer electrolyte membrane". Celtec[®] L or Celtec[®] P membranes are very soft and do not have a mechanical strength as compared to the Nafion[®] based materials, Hence in order to improve the handling of the "soft" membrane the instant invention was made.

The diagram illustrates the layered structure of a membrane electrode assembly (MEA). It shows a central layer labeled "Membrane (Celtec® L or P)" which is coated with a catalyst. This central layer is flanked by two "Polyimide (coated)" layers. The entire assembly is shown in a cross-sectional view, with arrows indicating the direction of flow or reaction through the layers.

Pineri discloses a porous substrate which is filled with a proton conducting material (see the abstract). In order to "immobilize" such proton conducting material (to retain it in the porous substrate (like a sponge) two surface layers 1 and 3 (on both sides one, coating the entire surface) are attached to the "filled", porous matrix/substrate 5. Proton conductive material can be sulfonated polyimides (see paragraph no. [0029]).

The surface coating materials (sulfonated polyimides) are proton conducting material which can not serve as a gasket, because these materials are "active" materials in conducting protons. The sulfonated polyimides of Pineri are part of the proton conductive membrane which acts like a barrier layer for the porous substrate being filled with conductive material (to avoid a

"wash out"). Pineri is silent of any gasket materials at all. Therefore, Pined does NOT anticipate the instant invention which deals with gasket frames.

Further, the Examiner's statement with respect to the applicant's claims 9 and 10 that Pineri would teach PBI/Phosphoric Acid system (high temperature systems) is absolutely wrong. Pineri, in [0050 and [0051] discloses functionalized oligomers, such as sulphonated oligomers, obtained from acids, such as dianhydride. These are the materials to form polyamides!! The acid group is covalently bond to the polymer backbone.

With respect to claims 12 and 25, these are product by process claims. The Examiner stated that he did not give the method of forming a membrane (claims 12 and 25) any patentable weight. M.P.E.P. §2113 states regarding product-by-process claims:

M.P.E.P. 2113 §2113 states:

"[E]ven though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process." *In re Thorpe*, 777 F.2d 695, 698, 227 USPQ 964, 966 (Fed. Cir. 1985) (citations omitted) (Claim was directed to a novolac color developer. The process of making the developer was allowed. The difference between the inventive process and the prior art was the addition of metal oxide and carboxylic acid as separate ingredients instead of adding the more expensive pre-reacted metal carboxylate. The product-by-process claim was rejected because the end product, in both the prior art and the allowed process, ends up containing metal carboxylate. The fact that the metal carboxylate is not directly added, but is instead produced in-situ does not change the end product.).

The **structure implied by the process steps** should be considered when assessing the patentability of product-by-process claims over the prior art, especially where the **product can only be defined** by the process steps by which the product is made, or where the manufacturing process steps would be expected to impart distinctive structural characteristics to the final product. See, e.g., *In re Garnero*, 412 F.2d 276, 279, 162 USPQ 221, 223 (CCPA 1979) (holding "interbonded by interfusion" to limit structure of the claimed composite and noting that terms such as "welded," "intermixed," "ground in place," "press

fitted," and "etched" are capable of construction as structural limitations.)
(*Emphasis added.*)

In other words, if the material formed as a result of performing the steps recited in Claims 12 and 25 is inevitably different from that of Pineri, then the membranes of Claims 12 and 25 are patentably distinct. These inevitable material differences are not required to be recited in the claims.

The Examiner's attention is directed to the decision of *In re Garnero*, 412 F.2d 276, 162 USPQ 221 (CCPA 1969), which is quoted in M.P.E.P. §2113. In *In re Garnero*, the court addressed the issue of patentability of a product-by-process claim in view of the art applied under 35 U.S.C. §103(a):

On appeal the solicitor's position appears to be that the only distinction between appellant's product and the products of the prior art is the process by which appellant's product is made [...] The solicitor is in effect reading claim 1 [...] as a product claim containing a process limitation [...] (412 F.2d 276 at 278).

The court rejected this approach:

The trouble with the solicitor's approach is that it necessarily assumes that claim 1 should be construed as a product claim containing a process, rather than structural, limitation. However, it seems to us that the recitation of the particles as "interbonded one to another by interfusion [...]" [...] is [...] capable of being construed as a structural limitation [...] (412 F.2d 276 at 279).

The court also gave clear guidelines for examination of a product-by-process claim:

The correct inquiry [...] is whether the product defined by claim 1 is patentably distinguishable over the [*cited references*] in view of the structural limitation [...] (*Ibid.*)
(*Emphasis added.*)

Similar to *In re Garnero*, the product formed as a result of the steps recited in the instant claims is structurally different from the product described in the cited reference, as explained by Applicants. The Examiner, therefore, should inquire whether the structural differences between the products defined by the instant claims patentably distinguish this product from the Pineri.

In summary, the Examiner is mixing up the sulphonated polyimide coating of the proton conductive matrix of Pineri with the instant gasket frame. It is noted that the "polyimide" in claim 2 does exclude any "sulphonated" groups. For the above reasons, this rejection should be withdrawn.

Rejections under 35 U.S.C. 103(a)

Claims 4, 5, 7, 17-19, 26, 29, 30, 34, 35, 39, 44, and 45 are rejected under 35 U.S.C. 103(a) as being unpatentable over Pineri as applied to claims 1 and 15 above and further in view of Cavalca. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Pineri in view of Cavalca as applied to claim 5 above and further in view of D'Agostino. Claims 8, 11, and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Pineri as applied to claims 1 and 10 above and further in view of Savinell. Claims 16-18, 20, 21, and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Pineri as applied to claims 1 and 19 above and further in view of Bonk. Claim 22 is rejected under 35 U.S.C. 103(a) as being unpatentable over Pineri as applied to claim 1 above, and further in view of Bonk and Okamoto. Claims 28, 31, and 33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Pineri and Cavalca as applied to claim 5 above, and further in view of Savinell. Claims 36-38, 40-41, and 43 are rejected under 35 U.S.C. 103(a) as being unpatentable over Pineri and Cavalca as applied to claim 35 above, and further in view of Bonk. Claim 42 is rejected under 35 U.S.C. 103(a) as being unpatentable

over Pineri and Cavalca as applied to claim 5 above, and further in view of Bonk and Okamoto. Claims 46 and 47 are rejected under 35 U.S.C. 103(a) as being unpatentable over Pineri and Cavalca as applied to claim 5 above, and further in view of Steck.

As stated above, Pineri teaches a porous substrate which is filled with a proton conducting material. In order to "immobilize" such proton conducting material (to retain it in the porous substrate (like a sponge) two surface layers (on both sides one) are attached to the "filled", porous matrix/substrate. The proton conductive material can be sulfonated polyimides.

Cavalca teaches a membrane electrode assembly (MEA) having a specific electrode/catalyst design with a special interfacial region (see the Summary of the Invention). Cavalca was merely combined with Pineri to render the subject matter of claims 4, 5, 7, and 17-19 obvious. The size/dimension as claimed by the instant claims (claim 4) is not the core of the instant invention and merely illustrates a specific embodiment.

With respect to the FEP coating, Cavalca teaches to have such material in the catalyst layer in order to improve the water repellency in the electrode structure. However, this is not a coating on a polyimide frame subgasket.

D'Agostino teaches the grafting of monomers on a film, such as a FEP film (see the abstract). The FEP is a film and not a coating on a polyimide film. Further, the FEP is used as starting material for grafting with the monomers disclosed in col. 4 (see formula) for producing a membrane. Such a kind of combination is totally remote and the Examiner pick's individual elements from the prior art to render the instant invention obvious.

Savinell in general teaches acid doped membranes based on polybenzimidazoles and phosphoric acid. It is true that such membranes as claimed in claims 8 to 11 are already known. However, Savinell neither is silent of any mechanical problems associated with such type of materials nor provides a solution how to improve lifetime using a polyimide frame as subgasket.

Bonk teaches a fuel cell. In Figure 2 the difference to the instant invention becomes obvious. In Figure 2, the "membrane" (#48) faces two catalyst layers (#40, #44) which have gas diffusion layers as backing (#50, #38). At the outer edge, a seal/gasket (#46, #42) is located to make everything gas tight. The seal/gasket has only an overlap with the "membrane" but not with the catalyst layers (the arrangement of gas diffusion layer and catalyst layer is the electrode). There is no overlap with the electrode surface as the instant invention teaches (see claims 45 and 46). Since there is no arrangement whereby the subgasket is between the electrode surface and the membrane surface in a frame design, the problem with the poor mechanical strength is not solved. Hence, such combination can not render the instant invention obvious.

Okamoto teaches a sealing/gasket #11 surrounding the membrane #5 and #6. There is no seal member #11 arranged between the membrane (#5, #6) and the electrodes (#9, #10). Okamoto teaches an "edge" seal and not a frame subgasket film located between the membrane and the electrode. Since there is no arrangement whereby the subgasket is between the electrode surface and the membrane surface in a frame design, the problem with the poor mechanical strength is not solved. Hence, such combination can not render the instant invention obvious.

Steck does not disclose a polymer electrolyte membrane, characterized in that there is a polyimide layer on each of the two surfaces of the polymer electrolyte.

A statement that modifications of the prior art to meet the claimed invention would have been "obvious to one of ordinary skill in the art at the time the invention was made" because the references relied upon teach that all aspects of the claimed invention were individually known in the art is not sufficient to establish a *prima facie* case of obviousness without some objective reason to combine the teachings of the references. *Ex parte Levengood*, 28 USPQ2d 1300 (Bd.

Pat. App. & Inter. 1993). See MPEP § 2143.01 IV. “[R]ejections on obviousness cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness.” *KSR International Co. v. Teleflex Inc.*, 82 USPQ2d 1385, 1396 (2007) quoting *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006). Furthermore, the Examiner cannot selectively pick and choose from the disclosed parameters without proper motivation as to a particular selection. The mere fact that a reference may be modified to reflect features of the claimed invention does not make the modification, and hence the claimed invention, obvious unless the prior art suggested the desirability of such modification. *In re Mills*, 916 F.2d 680, 682, 16 USPQ2d 1430 (Fed. Cir. 1990); *In re Fritch*, 23 USPQ2d 1780 (Fed. Cir. 1992). Thus, it is impermissible to simply engage in a hindsight reconstruction of the claimed invention where the reference itself provides no teaching as to why the applicant’s combination would have been obvious. *In re Gorman*, 933 F.2d 982, 987, 18 USPQ2d 1885, 1888 (Fed. Cir. 1991).

The applicant believes that none of the references alone or in combination render the applicant’s claimed invention obvious. For the above reasons, these rejections should be withdrawn.

In view of the above amendment, applicant believes the pending application is in condition for allowance.

Applicant believes no fee is due with this response. However, if a fee is due, please charge our Deposit Account No. 03-2775, under Order No. 15588-00020-US from which the undersigned is authorized to draw.

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Respectfully submitted,

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